2009 ADSA-CSAS-ASAS Joint Annual Meeting
July 12-16, Montréal, Québec, Canada

Estimates of genetic parameters among body condition score and fertility traits in first-parity Canadian cows

C. Bastin[1*], S. Loker[2], N. Gengler[1,3] & F. Miglior[4,5]

[1] Animal Science Unit, Gembloux Agricultural University, Belgium

[2] CGIL, Dept. of Animal and Poultry Science, University of Guelph, Ontario, Canada

[3] National Fund of Scientific Research, Brussels, Belgium

[4] Dairy and Swine Research and Development Centre, Agriculture and Agri-Food Canada, Sherbrooke, Quebec, Canada

[5] Canadian Dairy Network, Guelph, Ontario, Canada

Context

- **Fertility** of the dairy cow is influenced by the extent and the duration of the **postpartum negative energy balance**

Estimated by the **Body Condition Score** (**BCS**)
(= subjective measure of the stored energy reserves of the cow)

- Selection for BCS could allow **indirect selection** for energy balance status and consequently for **fertility** and health

Objective

Estimate genetic correlations between body condition score and fertility traits for 1st parity Canadian cows

<u>Part of a larger project</u>:

Development of a genetic evaluation for BCS to allow Canadian dairy farmers to select cows for a better energy balance status at the early stage of lactation

Materials & Methods: data edits

- Only first parity Ayrshire and Holstein cows
- Body Condition Score records:
  - collected by VALACTA field staff in herds from Québec between 2001 and 2008
  - edits on herds (number and distribution of observations) and on records (deviant, high days in milk)
  - on average 3.9 records per cow in first lactation

Materials & Methods: data edits

- **Fertility traits:**
  - **extracted for herds with at least one BCS record**
  - **4 traits studied:**
    - **days between calving and 1st service (CTFS)**
    - **days between 1st service and conception (FSTC)**
    - **days between calving and conception = days open (DO)**
    - **56-days non return rate at 1st service (NRR)**

Materials & Methods

- Variances components estimation done by REML:
  - Ayrshire: on the complete data set
  - Holstein: on random herd-based data sub set

Traits	Ayrshire	Holstein	
	Complete data set	Complete data set	Sample
BCS	9,739	197,584	10,059 – 10,768
CTFS	11,950	207,553	11,439
FSTC	10,621	185,464	9,485
DO	10,621	185,462	9,485
NRR	10,996	198,888	9,965

Materials & Methods: models

- For each breed, four 2-trait animal models including random regression were used.

Allow to assess the genetic correlations over the lactation between BCS (as a longitudinal trait) and fertility traits (single parity record)

Materials & Methods: models

BCS

- year of calving x season of calving (F)
- age at calving x stage of lactation (F)
- herd x year of calving (RR)
- permanent environment (RR)
- genetic (RR)

Regression curves modeled with Legendre polynomials of order 2

Materials & Methods: models

BCS	CTFS – FSTC – DO
▪ year of calving x season of calving (F)	▪ year of birth x season of birth (F)
▪ age at calving x stage of lactation (F)	▪ age at calving x season of calving (F)
▪ herd x year of calving (RR)	▪ herd x year of birth (R)
▪ permanent environment (RR)	▪ environment linked with BCS (R)
▪ genetic (RR)	▪ genetic (R)

Correlated effects

Materials & Methods: models

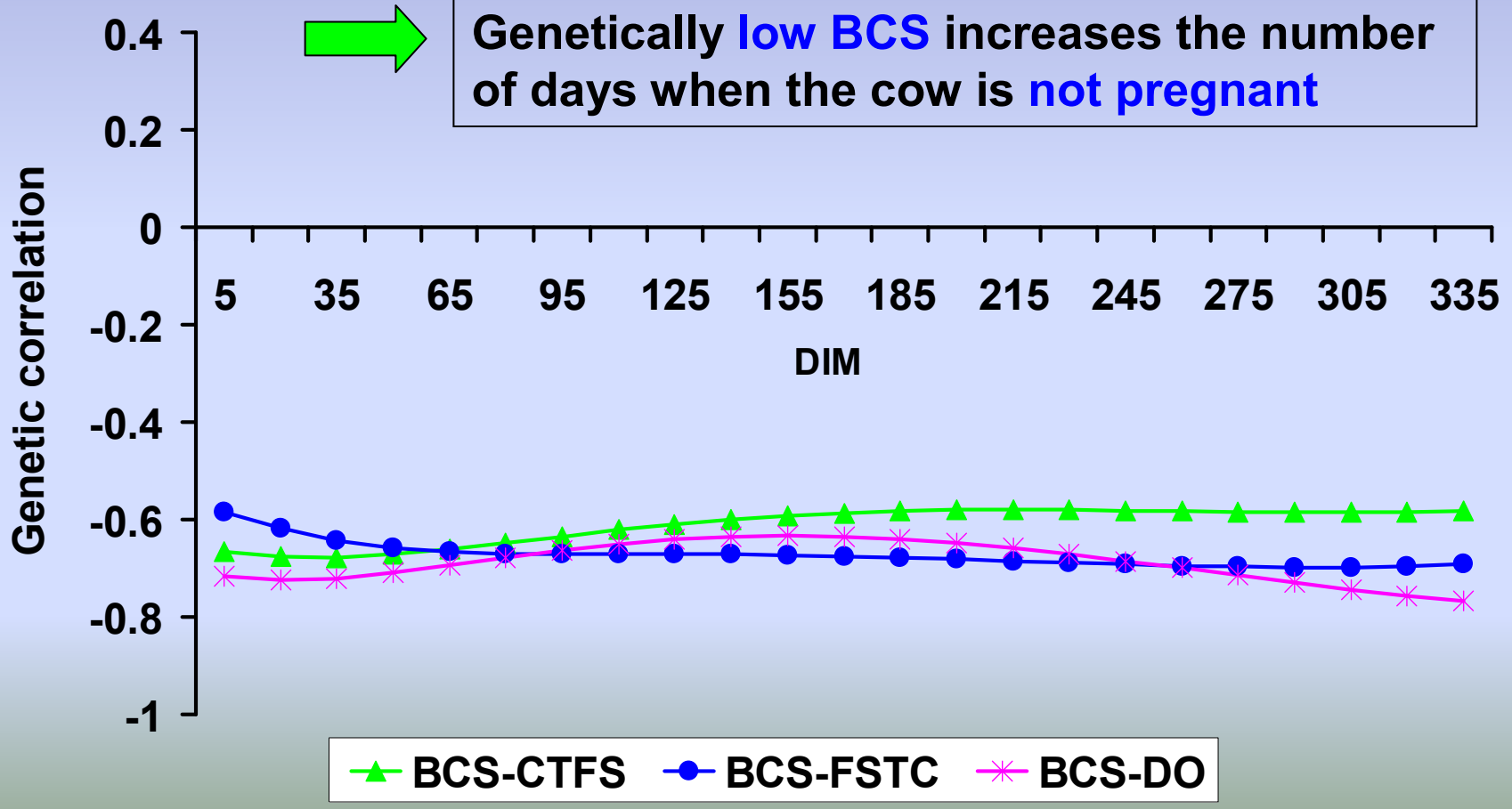
BCS	NRR
▪ year of calving x season of calving (F)	▪ year of birth x season of birth (F)
▪ age at calving x stage of lactation (F)	▪ age at calving x season of 1st AI (F)
▪ herd x year of calving (RR)	▪ herd x year of birth (R)
▪ permanent environment (RR)	▪ environment linked with BCS (R)
▪ genetic (RR)	▪ genetic (R)
	▪ AI technician x year of 1st AI (R)
	▪ service sire x year of 1st AI (R)

Correlated effects

Results: Ayrshire

Genetic correlations are negative and high (-0.58 to -0.77)

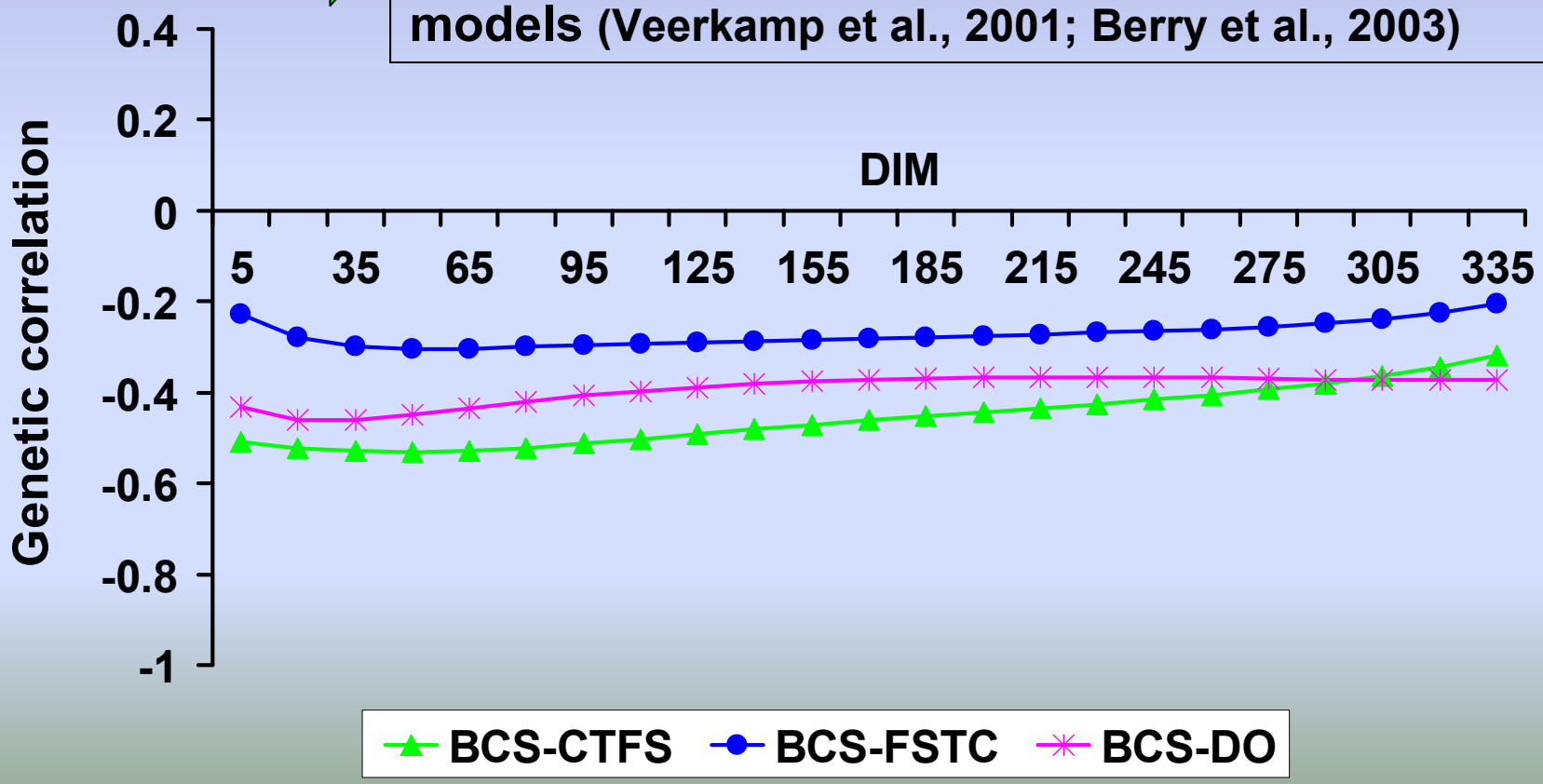
Genetically low BCS increases the number of days when the cow is not pregnant



Results: Holstein

Genetic correlations are negative and moderate (- 0.20 to - 0.53)

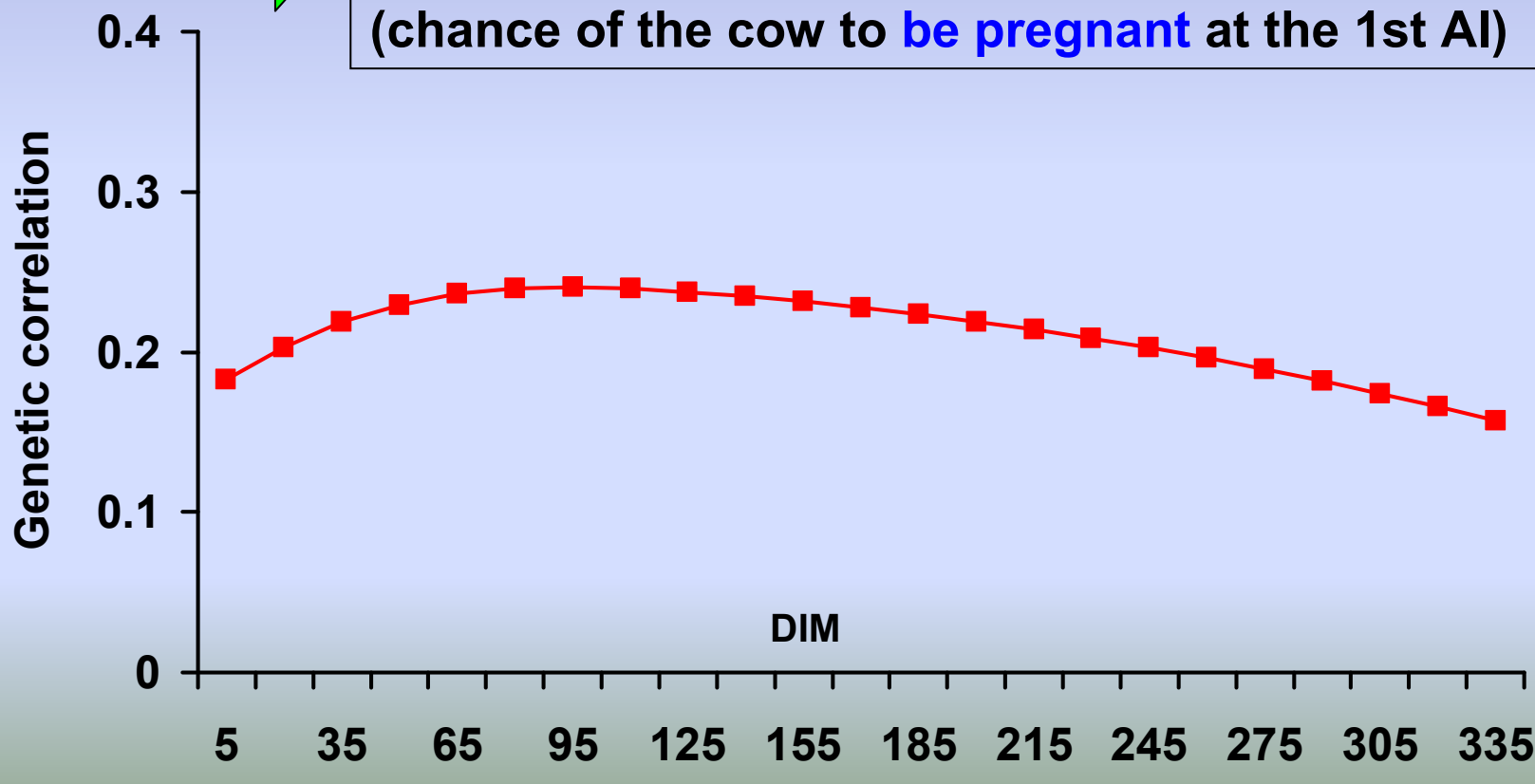
In agreement with previous studies using RR models (Veerkamp et al., 2001; Berry et al., 2003)



Results: Ayrshire BCS & NRR

Genetic correlation is moderate (0.16 to 0.24)

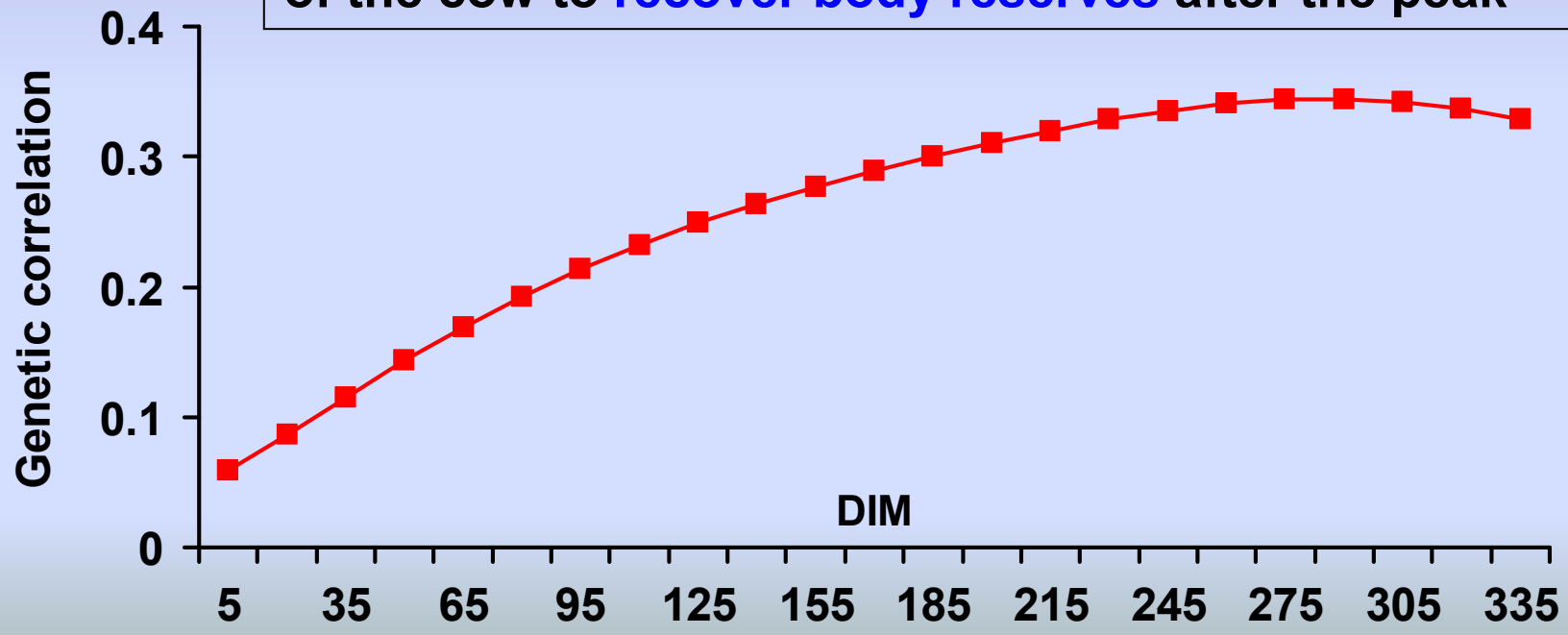
A genetically high BCS increases 56-days NRR (chance of the cow to be pregnant at the 1st AI)



Results: Holstein
BCS & NRR

Genetic correlation is moderate (0.06 to 0.34) and highest at the mid and late lactation

BCS at mid and late lactation could indicate the ability of the cow to recover body reserves after the peak



Conclusions

- Random regression models are useful to assess the genetic correlation through the lactation
- A genetically low BCS suggests poor fertility:
  - the number of days when the cow is not pregnant increases
  - the chance of the cow to be pregnant after the 1st AI decreases
- Correlations are larger in Ayrshire than in Holstein

BCS is a valuable indicator in indirect selection for better reproductive performances

Thank you for your attention!

Presenting author's e-mail:
bastin.c@fsagx.ac.be

Study supported through

- **grants of National Fund of Scientific Research (FNRS, Brussels, Belgium) and Wallonie-Bruxelles International (CGRI-DRI,WBI) SPW - DGA-RNE projects 2905-2906**
- **FNRS grants F.4552.05 and 2.4507.02**
- **DairyGen Council of CDN & NSERC of Canada**
- **VALACTA**